Our precision makes it possible

LASEA
LASER SOLUTIONS

Coming from the space industry, the LASEA group was founded in 1999 to respond to the growing needs of precision laser processes. A Belgian company, LASEA is internationally recognized in the laser industry. Right from its creation, it has specialized in automatic machines which use short and ultra-short pulse lasers.

Combining the most innovative equipment with industrial reliability without concession, we supply the most demanding sectors (medical, pharmaceuticals, luxury watchmaking). LASEA designs and manufactures workstations and special machines to solve applications such as marking, engraving, cutting, drilling, texturing, thin film ablation and micro-welding.

As a pioneer in femtosecond laser machining since 2003, LASEA continually invests in order to stay at the forefront of innovation. With a strong team of experts in optics, mechanical engineering and automation, LASEA develops new technologies and processes for the most complex applications.

Chosen by the references in these sectors, LASEA delivers and installs machines all over the world with a single objective: to supply its customers with a reliable, high precision result responding to the highest standards in terms of quality, while guaranteeing the confidentiality of each project and the shortest return on investment.

LASEA
Precision Laser Solutions
www.lasea.com

Axel Kupisiewicz – CEO

1999

- Development of coating removal applications (patented)
- Creation of LASEA

2000

- First industrial unit for glass coating removal
- Development of laser decontamination technology (patented)

2004

- First laser systems sold for pharmaceutical industry
- European FP6 project Naginels™ (Traceability and anti-counterfeiting applications)

2006

- First installations of "on-the-fly" film cutting & pharmaceutical traceability lines

2007

- Patent on femtosecond micro-machining
- ITM award as "Best practice in process"

2009

- First installation of a femtosecond micro-machining system
- Construction of a new 1000m² building in the Liège Science Park

2010

- First reference in the traceability of surgical instruments

2011

- World premiere of an industrial machine with femtosecond laser at the Laser World of Photonics trade fair in Munich, Germany
- Presence on the Swiss prestige watchmaking market

2012

- Creation of LASEA France
- World premiere in the field of cochlear implants in Australia

2013

- World premiere in the field of intraocular implants (IOL) in the United States

2014

- Trophy of Excellence and AWEX Export Award
- Doubling of the area surface of the facilities in Belgium

2015

- Development of the LS-Precess for cutting and drilling without taper (patent)
- World first in the field of pharmaceuticals (NAGINELS technology)

2016

- Creation of LASEA United States
- First installation of an extreme precision machine in the US (0.2 µm)
- Introduction of an 8 axis CNC machine in the LS range (5 mechanical axis and 3 scanner axis)

2017

- Creation of LASEA Switzerland
- WOW company acquisition, leader in automated solutions development

2018

- Development of LS-Plume
- First machine on the market with 7 axis simultaneous movements
- « Micron d'Or » at Micronora and First Walloon (Belgian) Price for Exportations Awards

2019

- Expansion of the sales network in France, in the UK and in Ireland
- Construction of a new facility in Liège (4000m²)

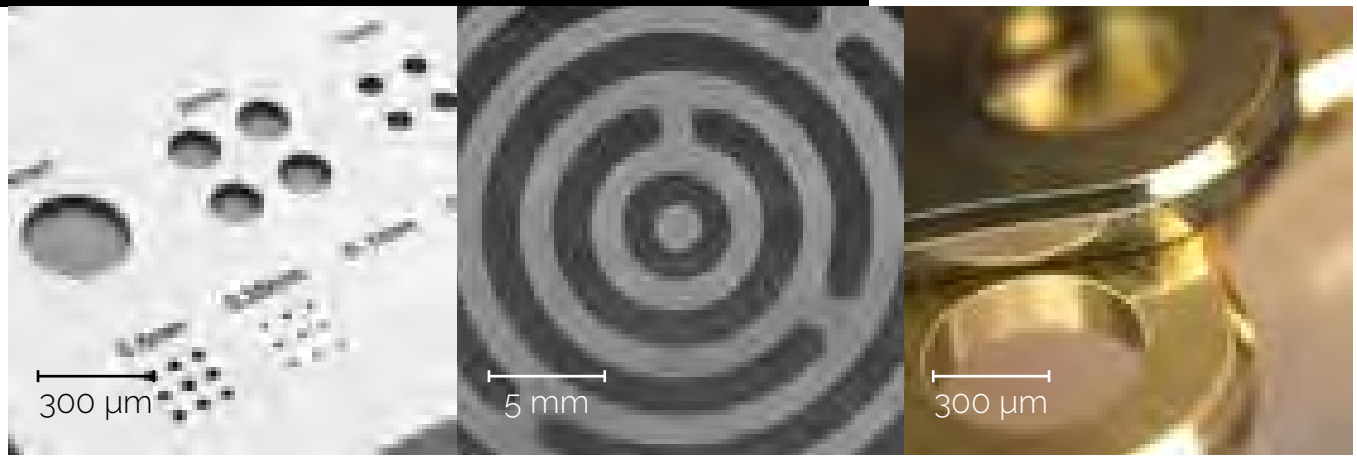
2020

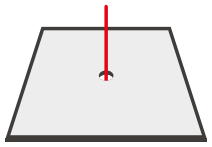
- LASEA acquires the OPTEC company, laser machines manufacturer, specialized in femtosecond and excimer lasers, dedicated to the medical and to the electronic industry

2021

- LASEA headquarter (Liège, Belgium) moves into a new building of 3500 sqm

Laser Micromachining

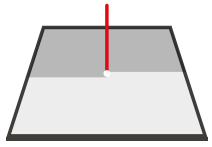




DRILLING

Laser drilling is a fast and precise way of producing a vast type of holes and can be applied to all materials, even the hardest or most fragile.

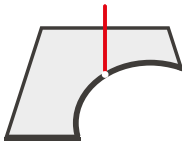
Picture: stainless steel



THIN FILM REMOVAL

Laser thin film removal enables selective engraving without delamination, bumps or micro cracks in the fields of solar cells, OLED's and microelectronics.

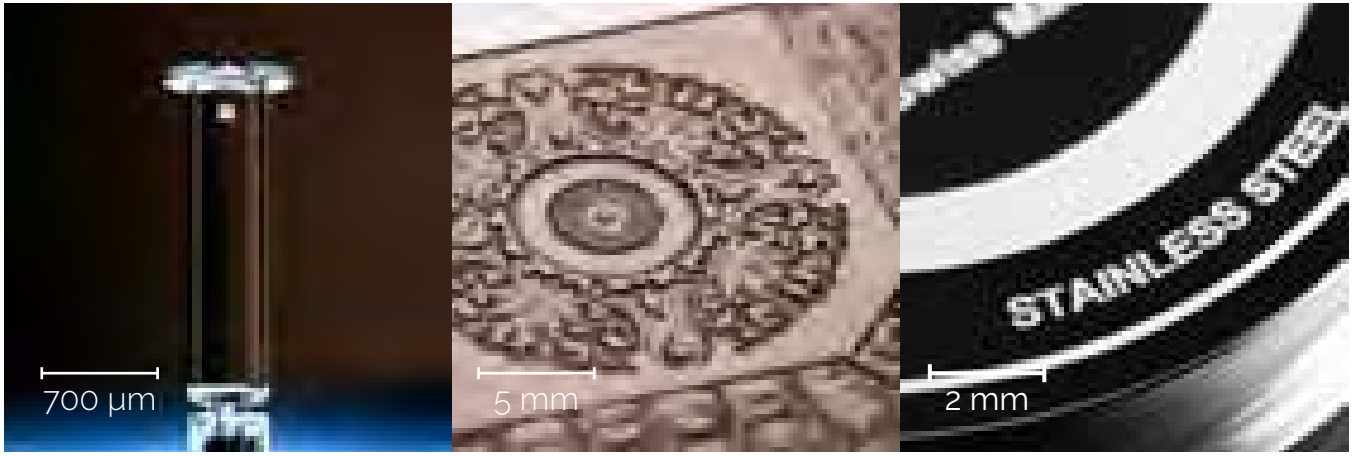
Picture: metal layer on glass

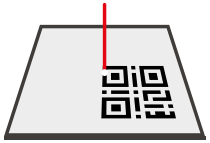


CUTTING

Laser cutting applies to all materials (hard, fragile, soft, etc.). This flexible and contactless technique offers clean and bumpless cut walls.

Picture: brass

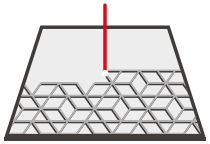




MARKING

Laser marking consists in permanently modifying the contrast of a surface. This process is flexible, clean (no additive), contactless (no wearing) and maintenance free. It can be used for the serialization of products or as an anti-counterfeit system.

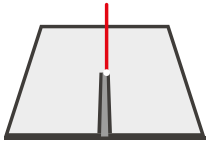
Picture: glass



TEXTURING

Laser texturing and patterning offers decoration or functionalization of all materials surfaces by fine and high speed engraving for either simple (lines) or complex patterns.

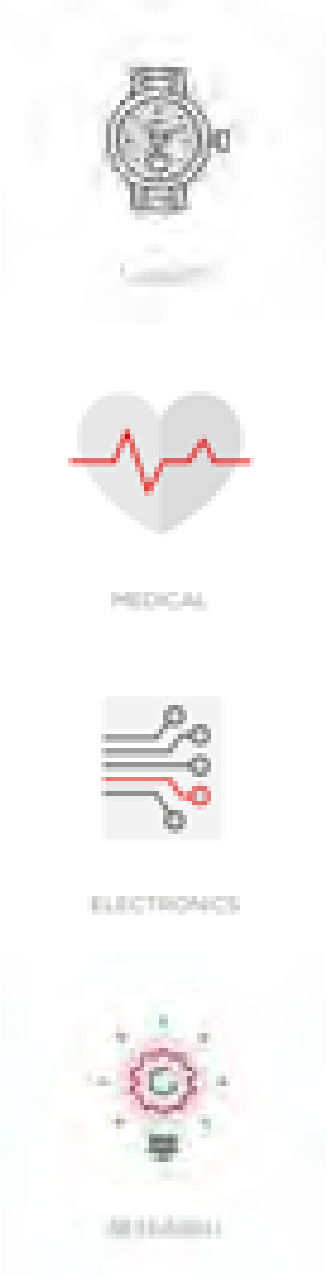
Picture: stainless steel



ENGRAVING

Laser engraving enables fast and contactless machining of embossed designs with perfectly monitored dimensions.

Picture: stainless steel



Feasibility tests

Innovation, our passion

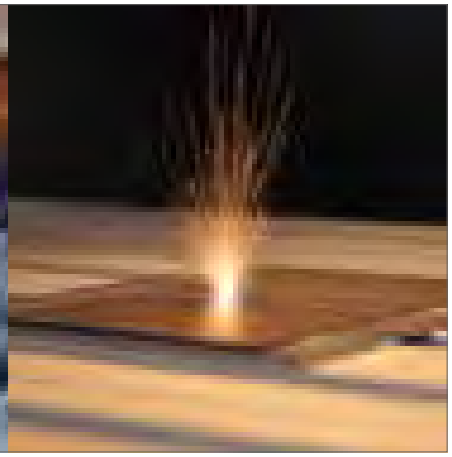
By partnering with the most renowned universities and European research centres, LASEA contributes to the development of new laser technologies and processes (FP6, FP7, Eranet, Eureka, H2020, programmes to name a few). Several projects have been considered as "success stories" by European R&D Organizations. We provide our skills and knowledge to implement new applications.

Production of prototypes

The LASEA Company is equipped with production zones in clean rooms and several application laboratories in order to guarantee high quality engineering work. Its engineers are able to develop machining processes for the production of prototypes or pre-series.

Customer request

Research



Development

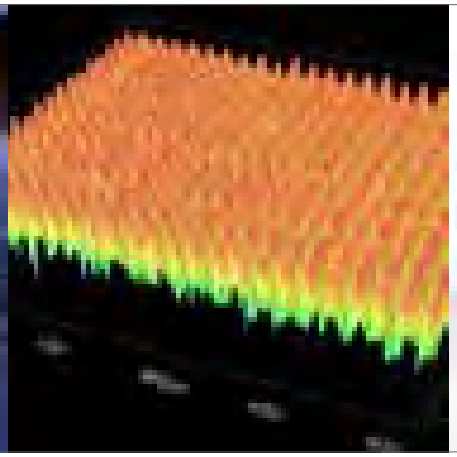
Our team and our equipment

The LASEA team of engineers is able to meet the most demanding challenges for our customers. The laboratories are equipped with the latest laser technologies: power laser diodes, fiber lasers, DPSS lasers, femtosecond lasers, CO_2 lasers. These lasers are integrated in machines that themselves are equipped with 2D and 3D scanners, linear axes or robots, and measuring and vision equipment.

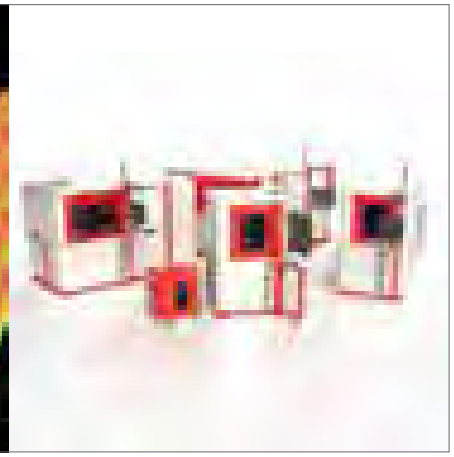
Originating from the Liège Space Centre, one of the five test centers of the European Space Agency, our team has access to very high precision equipment such as electron microscopes, spectrometers and contour followers, as well as many experts in optics and physics.

Quality check

Validation



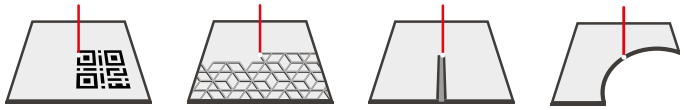
Expertise report with recommendations



LASEA solution

Machines

LS2



MARKING TEXTURING ENGRAVING CUTTING

Easy, reliable, ultra-compact

Designed for the machining of small parts, the tabletop LS2 workstation is a class 1 machine. Its robust design (welded mechanical structure) allows operation in the most demanding of environments. It allows for nanosecond or picosecond lasers integration with a simple « plug and play » installation.

LS2

Main specifications

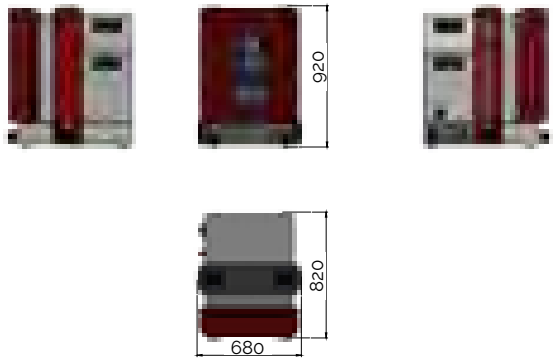
MACHINE	LS2 BASIC	LS2 MOTION
Mechanical axis	Z	X Y Z
XY Travel	-	200 x 200 mm
Z Travel	350 mm	350 mm
Nanosecond or picosecond laser source	From 10 to 50 W	
Scanner	LS-Scan XY	
Dimensions of the working table	650 x 480 mm	
Software	KYLA™	
Focusing assistance	Double pointer	
Door	Automatic	
ACCURACY / REPEATABILITY		
XY axis (par axis)	—	P±50µm R±10µm

Options

A (or B) axis	n x 360°	—
Accessories	Power meter, fume extractor	
Vision	Manual visualization and positioning camera	
Other	Fume extractor	

Dimensions

Width x Depth x Height	680 x 820 x 920 (nanosecond laser source) 680 x 980 x 920 (picosecond laser source)



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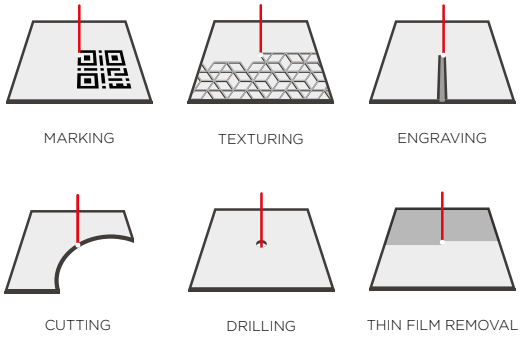
LS3



The ultra-compact machine

The LS3 has been specifically designed for micromachining applications in an industrial environment and integrates our complete range of laser sources. It is a compact, robust, modular and flexible machine thanks to its multiple options that allows micromachining applications with high quality.

LS3

Main specifications

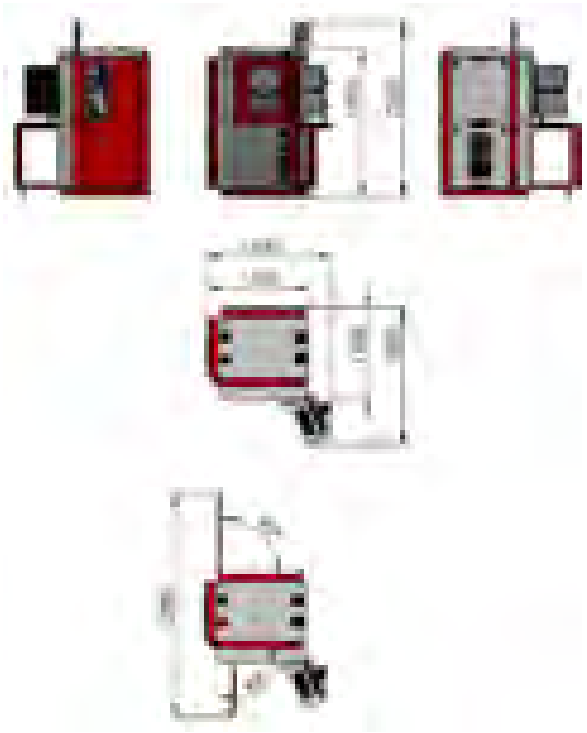
MACHINE	LS3 BASIC	LS3 MOTION
Mechanical axis	Z (200 mm)	XYZ (300 x 300 x 200 mm)
Femtosecond laser source	5 to 40 W	
Scanner	LS-Scan XY	
Dimensions of the working table	575 x 430 mm	-
Software	KYLA™	
Vision	Visualization and positioning camera	
Assistance for laser focus	Dual laser guide	
Table	Marble	
Door	Manual	
ACCURACY / REPEATABILITY		
XY axis (per axis)	-	A +/- 25 µm R +/- 5 µm

Options

LASER SOURCES		
Picosecond	30 W	
Nanosecond	10 to 100 W	
ROTARY AXIS		
A (or B) Axis	n x 360°	-
LS-MODULES		
3D Scanner	3D Module of the scanner (KYLA™ 3D included)	
Vision through the scanner	LS-View	
Beam management module	LS-Shape	
OTHER		
Vision	-	Cognex camera, shape recognition
Metrology	-	Optical profilometry (confocal sensor)
Automation	LS-HMI (Automatic sequence)	
Autofocus	Laser distance sensor	
Door	Automatic	
Accessories	Power meter, fume extractor, cutting nozzle, rotary table	

Dimensions

Width x Depth x Height	1350 x 1230 x 1950 mm (without chiller)



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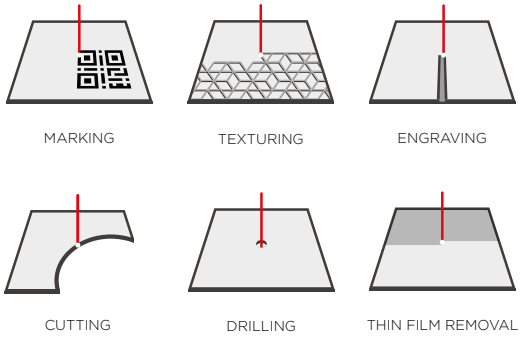
LS4



The accurate, compact, modular, upgradeable micromachining machine

The LS4 has been specifically designed for micromachining applications in an industrial environment. It integrates our complete range of laser sources. It is a modular and flexible machine thanks to its options developped to reach extreme precisions.

The 3D version allows micromachining of complex 3D pieces thanks to the combination of the mechanical axis and optical axis movements.

LS4 connected to LS-Robot

LS4

Main specifications

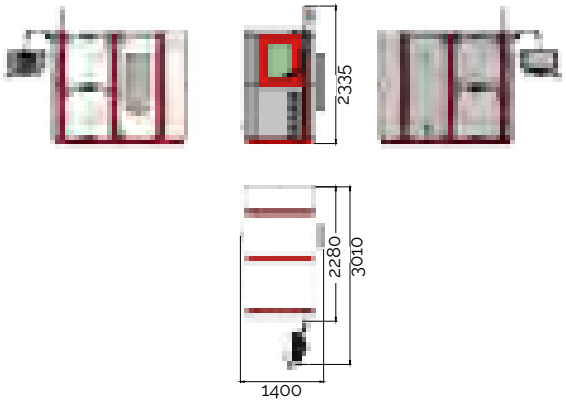
MACHINE	LS4 ACCURATE	LS4 ACCURATE 3D
Mechanical axis	XYZ	XYZAC
XYZ Travel	500 x 300 x 200 mm	
A Travel	-	-30° / + 90°
C Travel	-	n x 360°
Femtosecond laser source	5 to 50 W	
Scanner	LS-Scan XY	
Lens	Telecentric F-Theta	
Beam management module	LS-Shape	
Vision	Visualization and positioning camera	
Autofocus	Laser distance sensor	
Door	Automatic	
Air conditioned working area	Yes	
Electrical cabinet	Air conditioned	
Software	KYLA™	
Table	Marble	
ACCURACY / REPEATABILITY		
XY axis (per axis)	A : +/- 2 µm R : +/- 0.5 µm	
Axis A	-	A +/- 5 arcsec R +/- 3 arcsec
Axis C	-	A +/- 6 arcsec R +/- 3 arcsec

Options

LASER SOURCES	
Picosecond	30 W
Dual source	Combination of 2 sources (fs and ns)
LS-MODULES	
3D Scanner	LS-Scan Z (KYLA™ 3D included)
Zero taper cutting and drilling	LS-Precess
Vision through the scanner	LS-View
Robotization	LS-Robot module or external robot
OTHER	
Vision	Cognex camera, shape recognition
Metrology	Optical profilometry (confocal sensor)
Automation	LS-HMI (Automatic sequence)
Autofocus	Laser distance sensor
Accessories	Power meter, fume extractor, cutting nozzle

Dimensions

Width x Depth x Height	1350 x 2280 x 1950 mm (LS4) / 2290 x 2340 x 1950 mm (LS4 connected to LS-Robot)



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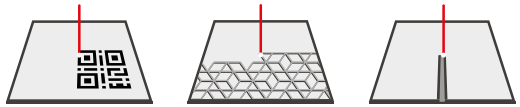
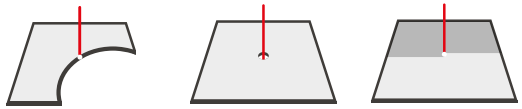
LS5



MARKING TEXTURING ENGRAVING



CUTTING DRILLING THIN FILM REMOVAL

The flexible machine for high precision micromachining

High precision work can be achieved with no risk of external disturbance thanks to its granite structure and external enclosure perfectly isolated from the internal structure. The LS5 can include all kinds of laser sources (some of the most powerful on the market), including femtosecond sources for micro-machining, or even multiple lasers for more flexibility. Extremely accurate features can be obtained at very high speed (several meters per second with acceleration ramps of only a few microns). The 3D version allows machining of complex 3D parts thanks to the combination of mechanical and optical axis movements. The integration of a robot in the enclosure (or externally) combined with a double-head make it an ideal machine for production environments.

LS5

LS5 connected to LS-Robot

LS5-2 with integrated robot

Main specifications

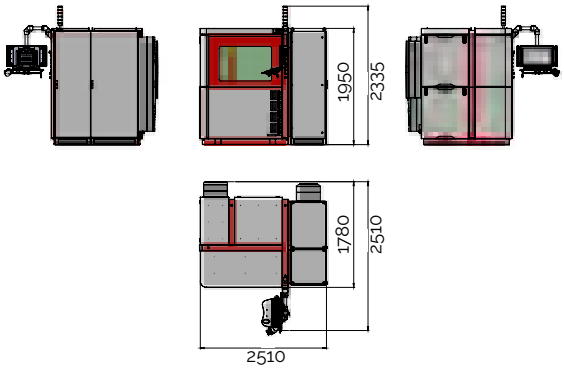
MACHINE	LS5 ACCURATE	LS5 ACCURATE 3D
Mechanical axis	XYZ	XYZAC
XYZ Travel	500 x 300 x 200 mm	
A Travel	-	-30° / +90°
C Travel	-	n x 360°
Femtosecond laser source	5 to 100 W	
Scanner	LS-Scan XY	
Lens	Telecentric F-Theta	
Beam management module	LS-Shape	
Vision	Visualization and positioning camera	
Autofocus	Laser distance sensor	
Door	Automatic	
Air conditioned working area	Yes	
Electrical cabinet	Air conditioned	
Table	Marble	
Software	KYLA™	
ACCURACY / REPEATABILITY		
XY axis (per axis)	A : +/- 2 µm R : +/- 0.5 µm	
A axis	-	A +/- 5 arcsec R +/- 3 arcsec
C axis	-	A +/- 6 arcsec R +/- 3 arcsec

Options

LASER SOURCES	
Picosecond	30 W
Dual source	Combination of 2 sources (fs and ns)
LS-MODULES	
3D Scanner	LS-Scan Z (KYLA™ 3D included)
Zero taper cutting and drilling	LS-Precess
Vision through the scanner	LS-View
Robotization	Pick & Place (plates, palets and/or workpieces) / LS-Robot module (plates, palets and/or workpieces) / Machine preparation for external robot
OTHER	
Vision	Cognex camera, shape recognition
Metrology	Optical profilometry (confocal sensor)
Automation	LS-HMI (Automatic sequence)
Autofocus	Laser distance sensor
Accessories	Power meter, fume extractor, cutting nozzle

Dimensions

Width x Depth x Height	2120 x 1680 x 1950 mm (LS5) / 3060 x 2130 x 1950 mm (LS5 connected to LS-Robot)



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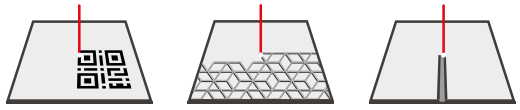
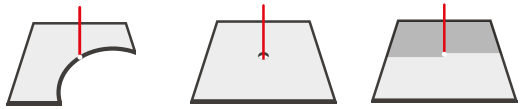
LS6



MARKING TEXTURING ENGRAVING



CUTTING DRILLING THIN FILM REMOVAL

For large dimensions parts

The LS6 is the laser machine that opens wide its doors to a world of precision. Thanks to its motorized doors and its wide accesses to the processing zone, the LS6 can operate both manually and with automated loading. It's also designed to process large parts such as glass plates and photovoltaic panels.

Thanks to its translation stages, this machine allows for large plates machining at high speed while keeping high precisions.

LS6

Main specifications

MACHINE	LS6 ACCURATE
Mechanical axes	XYZ (linear)
XYZ Travel	1.000 x 1.000 x 200 mm
Nanosecond laser source	10 to 100W
Scanner	LS-Scan XY
Beam management modules	LS-Shape
Software	KYLA™
Vision	Visualization camera
Autofocus	Laser distance sensor
Door	Automatic
Electrical cabinet	Air conditioned (air/air exchanger)
Table	Marbre
Lens	F-Theta telecentric 100 mm
Scanner	LS-Scan XY
Air conditioned working area	Yes
ACCURACY / REPEATABILITY	
XY axis (per axis)	P±4µm R±0,75µm
Z axis	P±10µm R±1µm

Options

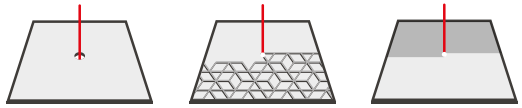
LASER SOURCE	
Femtosecond	5 to 100W
LS-MODULES	
3D Scanner	LS-Scan Z (KYLA™ 3D included)
Zero taper cutting and drilling	LS-Precess
OTHER	
Vision	Cognex camera, shape recognition
Metrology	Optical profilometry (confocal sensor)
Automation	LS-HMI (Automatic sequence)
Robot	Pick & place module
Accessories	Fume extractor

Dimensions

Width x Depth x Height	2300 x 2300 x 2000 mm

- Not available in this configuration

LightShot **LSV3**



DRILLING TEXTURING THIN FILM REMOVAL

UV Excimer Catheter Processing Workstation

Versatile, robust and easy to use, the LightShot V3 (LSV3) makes it possible to bring laser processing in-house and reduce manufacturing costs, without the need for a skilled technician.

Optec's intuitive ProcessPower™ software includes methoddevelopment functions that facilitate writing recipes for rapid-prototyping, pre-production and full production.
The LSV3 is equipped with maskprojection optics under PC control for "photolithography precision" ablations that removes insulation, residue and flashing without damaging the metal surface and with sharp transitions from polymer to metal..

Unparalleled, deep-UV laser catheter processing.
A self-contained workstation for R&D or production.

Polymers, epoxy, glue

Reduce OD of tubing, ablate windows, drill thru holes and blind holes. Remove flashing from electrical contacts and electrodes, and more.

Featuring

- Deep-UV laser micromachining yields minimal HAZ (heat affected zone) without debris, residue or oxides.
- No damage to electrode.
- Flat, uniform beam removes ~ 1/3 um per shot.
- Confocal performance - when the part is in the laser beam is in focus for rapid processing with high repeatability.
- Continuously variable demagnification optics amplify the energy density when more power is needed for challenging materials.
- User friendly software routines make it easy to develop part processing recipes.
- Precision ablation depth control down to 100nm per shot (material dependent) and energy density control for removing material layer-by-layer.
- High definition imaging down to 1.5 µm; submicron part positioning resolution and micron level ablation accuracy.

Main specifications
Air-cooled, SFF* excimer laser
248 nm or 193 nm wavelengths
Mask-projection "flat" ablations
Live, zoom video microscope color viewing
Pneumatic rotary chuck with collets
Sub-micron resolution motion control
Integrated NEMA 12 gas cabinet
Integrated industrial PC
Auto-focus software function
Fume extraction
Class 1, interlocked, safety enclosure

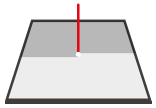
* Small Form Factor

OPTIONS: Automatic catheter feeders

Optec is the leading provider of A-thermal laser processing systems specializing in deep-UV excimer & femtosecond laser configurations, plus fiber, YAG and TEA CO_2 laser systems when required of the application.

Optec products are made-to-measure to suit the specific needs of each customer.

Echo 360



THIN FILM REMOVAL

Fine-wire, UV laser stripper

Nothing strips fine-wire like a UV laser. with few exceptions, and none do it better than the Optec Echo 360 with it deep UV, 248 nm or 193 nm output, air-cooled, small format EXCIMER laser.

The Echo 360 is fast, versatile and safe. Optec's intuitive Process Pro™ software control makes it easy to operate, with minimal instruction and rapid change over to different wire gauges.

The Echo 360 serves aerospace, MEMS, automotive, consumer electronics, telecom and medical devices, including cardiac rhythm, neuro, electro-physiology and many other demanding applications.

A turnkey workstation from the A-thermal laser experts.

Throughput equal to multiple mechanical & chemical stripping stations.

Residue-free ablation of most polymers and other coating materials.

No handling or wire rotation needed for perfect results every time.

Conventional lasers, such as a 355 nm YAG, have a focused, Gaussian beam that scans the insulator using the highest intensity 'point' of the beam. This makes it difficult to regulate the amount of energy needed to strip the coating without changing the surface of the metal conductor.

The Echo 360's flat-top beam ablates a large area of the coating evenly by means of aperture imaging and ECHO technology. This gives total control over the stripping process when transitioning from coating to core, along with sharper edges. One can also ablate 'windows' in ribbon cables.

The deep-UV, excimer light is absorbed more readily by most insulating materials than 266 and 355 nm YAG lasers, and just enough energy is absorbed by the conductor to yield a residue-free surface for post-process soldering, welding, bonding or crimping.

Optec's proprietary ECHO beam delivery system (BDU) irradiates the wire uniformly from all sides, stripping a sub-micron layer of the insulator material away with each pulse of the laser. It's high-speed, non-contact ablation make ECHO 360 the preferred choice for fine-wires.

Your return on investment

- Improve quality, yield & throughput
- Innovate and protect IP
- Bring outsourced laser stripping in-house

  Proof of concept samples provided upon request.

Featuring

- Strip 360o without rotating the wire
- Down to 60 AWG
- Non-contact, no damage to the core
- Residue-free & oxidation-free
- No chemicals or hazardous waste
- More than 2X faster than UV YAG lasers
- Single, bifilar, trifilar, quadfilar
- Wire separation & cutting options
- All wire types, including magnetic
- Reel-to-reel & reel-to-cut & singles
- Compact, self-contained, mobile
- Color touch-screen display
- 1B+ shots without factory service

Main specifications
Air-cooled, small-format, excimer laser
248 nm or 193 nm wavelength
Aperture imaged, flat-top beam
Purged beam path
Coaxial, live video microscope
Shield gas assist and debris removal
< 1 mm static, > 1 mm dynamic stripping
60 AWG to 32 AWG * wire diameters
Spool-to-spool & spool-to-cut fixturing
Compact, self-contained, mobile cart
Class 1, interlocked, safety enclosure

* For larger size wires, and other configurations including fully automated production systems, YAG and TEA CO_2 models, contact Optec.

Special machines

Special laser machines, tailor-made solutions

The LASEA laser systems have been specifically designed for simple and rapid integration into our workstations and the specific environments of our customers, for which we can design the best solution.

Our teams of mechanical design, electrical, electronics, software and automation engineers develop the solution according to a precise specification sheet.

In addition to laser solutions, being our main expertise, LASEA also has great experience with automation, robotics, vision and human-machine interfaces, which completes our tailor-made machine offering.

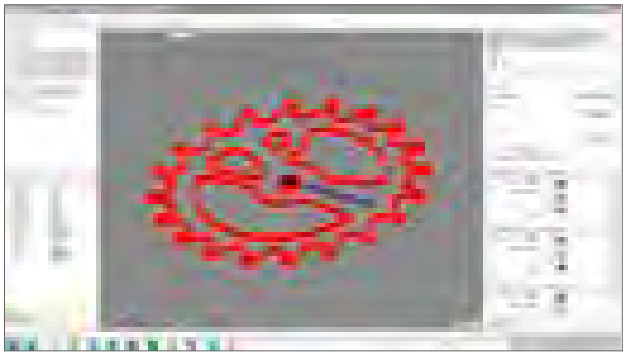
Do not hesitate to present your project to us. Whatever its complexity, we will find solutions to carry it out.

MACHINES

Software

SOFTWARE

KYLA™



Control software

The laser processes are programmed by the LASEA control software, KYLA™. This software package controls all the devices and material functions (as they come standard or as options) offered by LASEA.

A complete version of KYLA™ is supplied with every LASEA machine.

All the devices controlled by KYLA™	
Laser sources	Wavelength, repetition rate, emitted laser power, pulse duration
Mechanical shutters	Opening or closing
Power attenuators	Transmitted powers
LS-Shape	Enlargement factor from x1 to x5
LS-Scan	Scan speed, position, acceleration ramps, repetitions
LS-Precess	Speed, taper angle, polarisation
LS-Polar	Polarization on target
Axis	Speed, position, acceleration
Cameras	Dimensional measurements of the displayed image, part recognition
Automatic focusing and contour following systems	Resolution and analysis zone
Power sensors	Duration of the measurement
Fume extractor	Activation and deactivation

On the basis of .dxf, .stl, .jpeg, .bmp files or a fresh file creating text objects, barcodes or geometric shapes, it is possible to very quickly obtain a 2D or 3D track ready to be executed. The software automatically transcribes the image, text, or diagram created into movement vectors for the scanner or axes.

The user-friendly graphical interface enables the beam trajectories and also the parameters to be displayed and the laser parameters to be controlled. This graphical interface can also be replaced by an interface in the form of movement commands of the G-code type.

Main functionalities
Loading, editing, and saving of formula and configuration files
Import of DXF, STL, BMP, or JPEG files
Creation of texts with Windows TrueType fonts, "Single Stroke", barcodes, or data matrices with automatic incrementing function or link with a database
Integration of a CAD module capable of changing the machining motifs in DXF formats
Automatic generation of the laser beam path and display in 2D (3D as an option) of these tracks
Display and modification of the parameters linked to the laser, movements of the scanner and the axes
Automatic generation of optimization matrices
Automatic and synchronized control of the scanner and the axes
Display of camera images, possibility to save the images and video films and to take measurements
Automatic registration of log files including the laser, scanner and axis parameters
Functions to assist calibration

LS-HMI

The HMI perfectly suited to the industrial environment

In industrial production, the tailor-made machines and workstations of LASEA can be equipped with the human-machine interface LS-HMI. The control console is equipped with a touch screen that displays and controls the alarms as well as the configuration and production parameters.

The LS-HMI has control and monitoring operative functions (manual and automatic mode), production counters, users management and the possibility to display all of the digital and analogue inputs/outputs for rapid diagnosis in the event of an alarm.

The LASEA LS-HMI has been designed to facilitate the operator's task:

- Ergonomically redesigned
- Quick and intuitive access to information
- User-friendly interface

Main specifications

22" touch screen
KYLA™ & EasyKYLA
Audit trails, reports
Data exchange with the ERP of the company (option)
Users and Passwords management

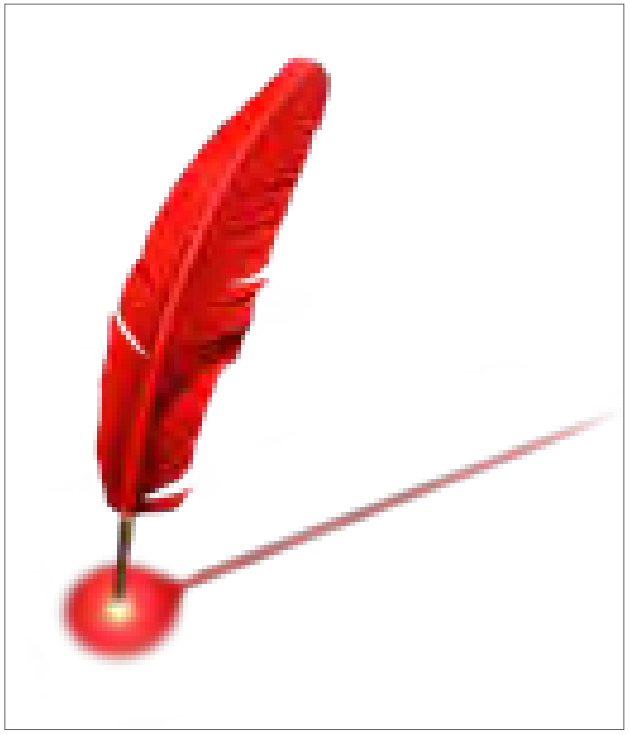
Views

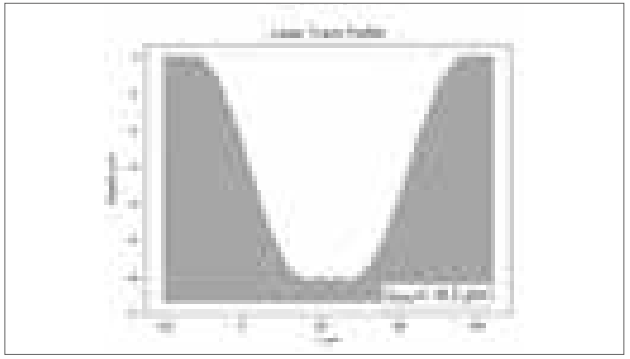
Main information	Production order and current recipe, production counter
Detailed information	Image of the treated part, logged user, list of latest alarms
Process	General status of the machine, M.O. and processes online
Recipes	Management of the general production parameters
Settings	Management of the general parameters of the machine
Status	Diagnostic of the electrical signals connected to the PLC
Forcing	Diagnostic of the failures by using offline the outputs of the PLC
Reports	Display of the archived information

History

Alarms
Manufacturing Data
Operator actions
Tracking curves

LS-Plume





LS-Plume®, simulation tools for ultrafast laser micromachining

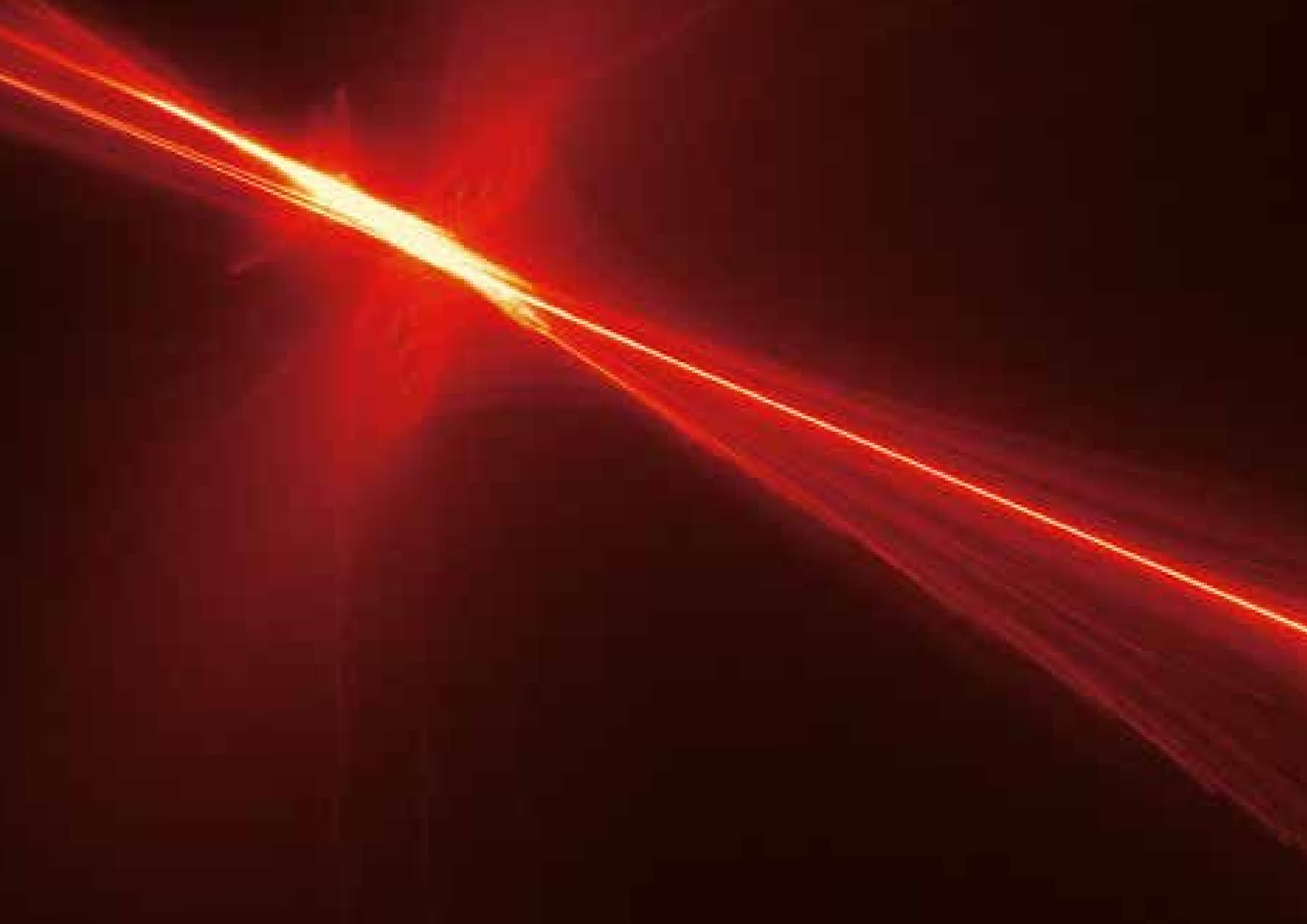
It has been thoroughly demonstrated in the past years that ultrafast lasers are excellent tools for micromachining virtually all types of materials, provided that a good window of processing parameters is chosen so that the resulting thermal effects are negligible.

The ablation topography resulting by irradiation with these lasers typically depend on several factors related both to the laser beam and the material characteristics. As a consequence, the search for the optimal processing parameters that lead to some required ablation dimensions on a given material can be time consuming.

To enhance this parameters search, LASEA developed the application tool LS-Plume®, based on a numerical model that allows estimating the ablation profiles of scanned lines and areas, as well as drilled cavities. The processing parameters required to run the application are the pulse energy, beam waist at the focus, pulse repetition rate, scanning speed and beam tilting angle, whereas the characteristics of the material required are the ablation threshold fluence, the refractive index and the radiation penetration depth.

The results obtained by the application were validated by comparison to the ones obtained experimentally, including for controlled taper drilling, at a wide range of processing parameters. The good results estimated by the application also allow for the optimization of the micromachining process, both energy and time wise.

www.ls-plume.com



Laser Sources

Laser Sources

Satsuma (Amplitude Systèmes)

Pharos (Light Conversion)

Nanosecond laser (IPG)

The most powerful femtosecond laser on the market

LASEA can integrate many laser sources in our machines in order to closely match the specifications of our clients. LASEA is a pioneer in the integration of femtosecond lasers in industrial installations. Ultrashort lasers have emerged as important tools in scientific and industrial fields. Fiber lasers offer very attractive prospects for obtaining a high average power.

We also use nanosecond laser sources, as well as high power sources for most thermal applications such as welding, while being infrared, ultraviolet or visible.

LASEA has forged strong links with the best suppliers of laser sources such as Amplitude Systèmes and Light Conversion for femtosecond lasers, IPG Photonics and Synrad for nanosecond lasers.

Amplitude Systèmes relies on innovative developments in the field of the conception of fibers and laser amplifiers to offer a range of ultra-short fiber lasers with simultaneous high average power and high output energy.

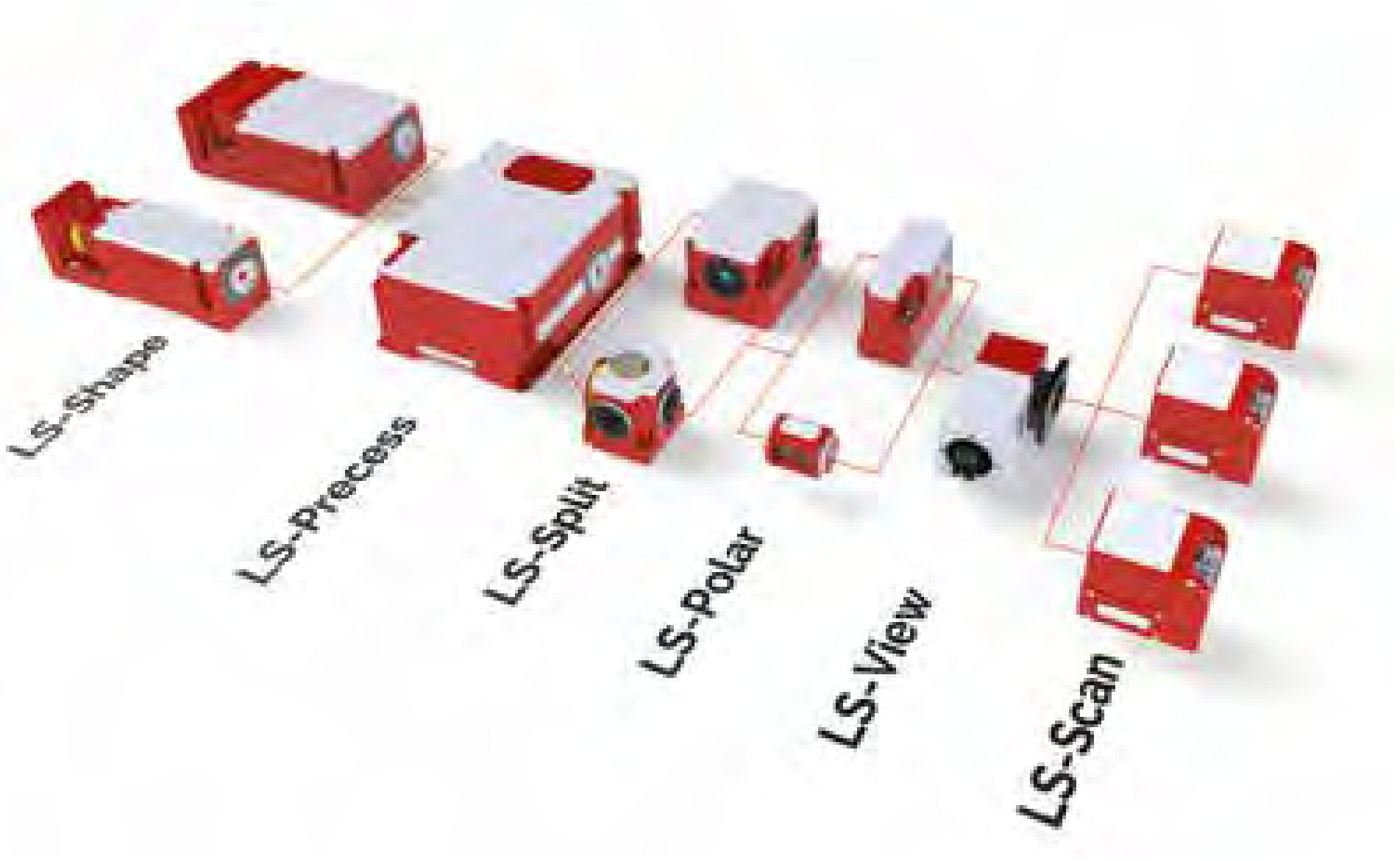
The innovative design of Light Conversion lasers brings a new approach by integrating the oscillator, the compressor and the amplifier in the same mechanical structure. Thanks to their average power and high pulse energy, these industrial femtosecond lasers are excellent tools for many micromachining applications.

LASEA's FL range of fiber laser systems (from 10 to 100W) includes a pulsed IPG laser with very high reliability (MTBF > 100,000 h). This laser delivers a high power laser beam with a pulse duration of 4 to 200ns in order to benefit a maximum energy and to adapt to sensitive materials with short and high speed pulses.

AMPLITUDE SYSTÈMES	Satsuma	Satsuma HP	Satsuma HP²	Satsuma HP³	Tangor	Yuja
Wavelength	343 nm • 515 nm • 1030 nm					
Maximal power	5 W	10 W	20 W	50 W	100 W	10 W
Pulse energy	10µJ	20µJ	40µJ	40µJ	300µJ	100µJ
Pulse duration	350fs - 10ps				500fs – 10ps	500fs – 10ps
Maximal repetition rate	2 MHz					
Operation mode	Pulsed					
Compatible LASEA machines	LS3 • LS4 • LS5 • LS6			LS5 • LS6	LS5 • LS6	LS3 • LS4 • LS5 • LS6
Applications	Marking • Engraving • Cutting • Drilling • Thin layer removal • Texturing					

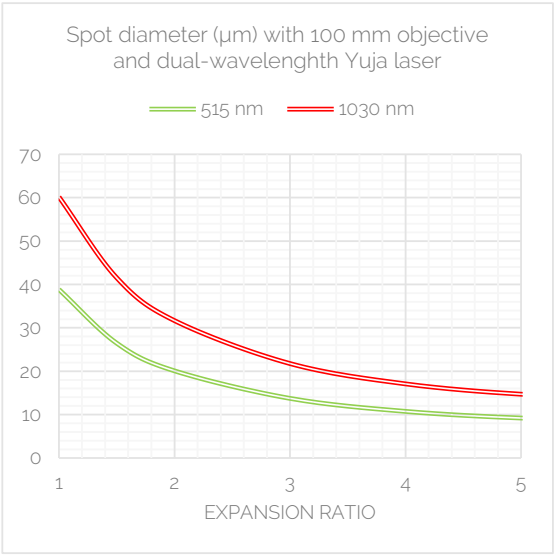
LIGHT CONVERSION	Pharos	Carbide
Wavelength	343 nm • 515 nm • 1030 nm	
Maximal power	6 - 20W	4 – 40 W
Maximal pulse energy	200 – 2.000 µJ	65 – 400 µJ
Pulse duration	190fs – 20ps	
Maximal repetition rate	1MHz	1MHz
Operation mode	Pulsed	
Compatible LASEA machines (depending on wavelength and laser configuration)	LS3 • LS4 • LS5 • LS6	
Applications	Marking • Engraving • Cutting • Drilling • Thin layer removal • Texturing	

IR NANOSECOND	FL 20	FL 20 T	FL 30	FL 50	FL 100
Type	Fiber laser (Ytterbium)				
Wavelength	1064 nm				
Maximal power	> 20W	> 20W	> 30W	> 50W	> 100W
Pulse duration	100 ns	4 ns to 200 ns	100 ns	100 ns	100 ns
Operation mode	Pulsed				
Compatible LASEA machines	LS2 • LS3 • LS4 • LS5 • LS6				
Applications	Marking • Engraving • Cutting • Drilling • Thin layer removal • Texturing				


LS-Shape
LS-Precess
LS-Split
LS-Polar
LS-View
LS-Scan

Modules

LS-Shape



LS-Shape

Beam conditioning module

Dedicated to laser microprocessing, the LS-Shape is a unique beam conditioning module, inevitable for mastering fine laser processes. In particular, it makes it possible to precisely control the size of the laser impacts on the workpiece, as well as the transmitted power.

While it is not relevant to have access to a lot of fine parameter tuning on conventional marking or machining applications, ultrashort processes require much more attention on pulse overlap or power density, or on the preservation of a perfect optical quality. It is however difficult to prevent from astigmatism on enlarged beams for example. Beam attenuation is also tricky due to changes on beam geometrical shape with AOMs, or on pulse length with diode current modulation. Finally, commercial variable beam expanders first reduce the beam diameter before expanding it, boosting non-linear self-focusing effects and increasing the risk of damaging the lens coating. The LS-Shape is the solution for all these points.

Apart from the choice of laser, it is this beam conditioning which defines the process quality, efficiency, and repeatability. The LS-Shape is the right tool for this optimization and its quick alignment steps make its integration very easy. Finally, for high productivity installations, replacement of this module is immediate to continue the production, while the repair is done.

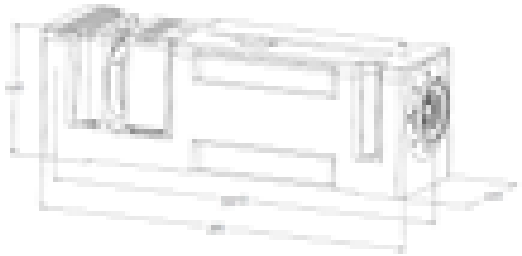
Two LS-Shape versions are available: The LS-Shape Access includes an attenuator and a beam expander, both manual, and a motorized beam shutter with position sensors for safety monitoring. The LS-Shape Flex includes the same functions but all motorized, and a photodiode for monitoring the power during the process and for automatically linearize the attenuator. Directly connected to a computer through an ethernet interface, the LS-Shape Flex can be driven by ASCII commands or by our software KYLA™, a full microprocessing software able to communicate with several stages, cameras, and lasers.

Key features

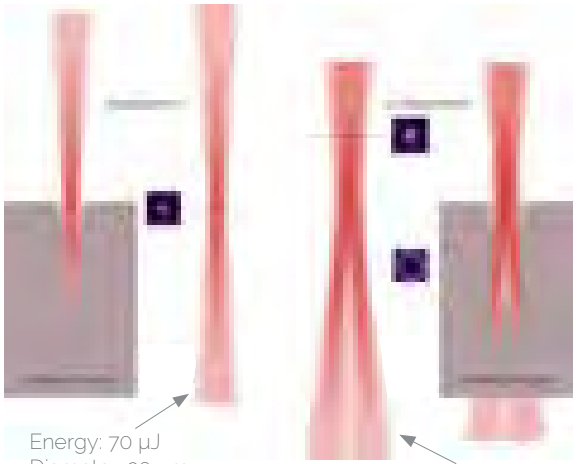
- Dual wavelength 515 + 1.030 nm
- Motorized safety shutter with sensors
- Variable beam expander (x1 to x5)
- Variable attenuator
- Beam dump
- Power measurement (Flex version)
- Optical design for high-power ultra-short lasers

Specifications	LS-Shape Access	LS-Shape Flex
Input aperture	10 mm (Advised beam diameter of max 6 mm)	
Wavelength	Dual wavelength 515 +/- 5 nm & 1.030 +/- 10 nm (343 +/- 3 nm upon request)	
Max input energy density	40 µJ/mm² @ 300 fs – 1.030 nm* 20 µJ/mm² @ 300 fs – 515 nm*	
Max input power density	8 W/mm² @ 300 fs – 1.030 nm* 4 W/mm² @ 300 fs – 515 nm*	
Max input power	100 W	
Input polarization	Linear laser polarization required	
Output aperture	20 mm (Advised beam diameter of max 12 mm)	
Transmission	> 90%	
Shutter closing time	< 500 ms	
Shutter position sensors	2 sensors for open position, 2 sensors for closed position	
Beam dump capacity	50 W continuously, 100 W during 1 min (water cooled option for continuous operation up to 100 W)	
Beam expansion	Manual setting x1 to x5 Divergence settings to focus at the same height Automatic ghost protection during the settings	Motorized settings x1 to x5 Divergence settings to focus at the same height Automatic ghost protection during the settings
Attenuation	Manual setting based on polarization (Min and max values dependent on input polarization linearity)	Motorized setting based on polarization (Min and max values dependent on input polarization linearity) Automatic linear calibration
Power measurement	None	Power sampling with calibrated ratio
Alignment	Factory aligned Reference irises for easy on-site alignment	
Size	398 x 108 x 126 mm	398 x 200 x 126 mm
Power supply	24 V – 1 A	24 V – 2 A
Shutter	Dry contact 24V output for sensors	
PC interface	None	Ethernet

**: Due to fused silica, at higher energies or powers, self-focusing effects may appear, which could eventually damage the following optical components.*



LS-Precess



LS-Precess

Controlling conicity

Ultrashort laser processes always lead to the formation of a conical trench. This conicity, of a few degrees, cannot be suppressed with a gaussian beam, even at high energy.
The LS-Precess is a module applying a special movement to the beam, at high speed. Around the focal spot, this engineered beam, hitting the surface with various attack angles, is able to crop both sidewalls of the trench.

The LS-Precess is well suited for drilling and cutting with a gas nozzle and stage movements, but it also allows the use of scanning heads, with the same ease-of-use as conventional scanner processes. There is no new software to master, nor complex helical trajectories to program. The LS-Precess can be seen as a tunable beam shaping system, with simple settings and unchanged during the process. LASEA's patented technology is the only one compatible with the use of scanners and F-Theta objectives, allowing processing fields up to 25 x 25 mm without taper.

It is also the only one compatible with a polarization splitter, allowing splitting the beam after the LS-Precess, down to as many scanners as needed for parallel processing.

Directly connected to a computer through an ethernet interface, the LS-Precess can be driven by ASCII commands or by our software KYLA™, a full micromachining software able to communicate with the scanner, several stages, cameras, and lasers.

Key features

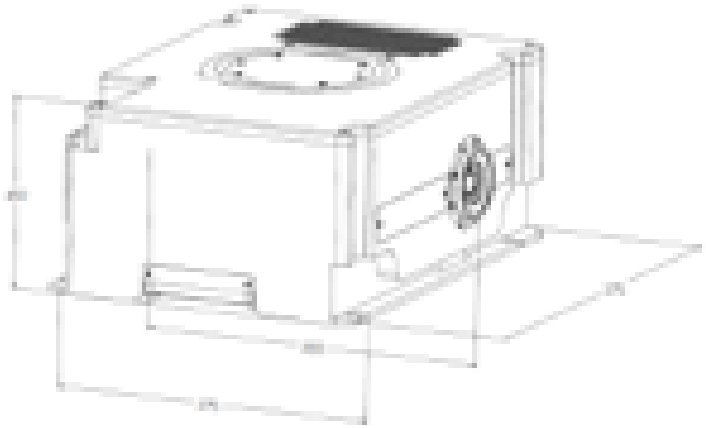
- Dual wavelength 515 + 1.030 nm
- High speed rotation of the attack angle
- By-pass function
- Easy to use
- 35 µm min kerf size

Specifications	LS-Precess
Maximum input beam diameter	6 mm for precession mode 12 mm for by-pass mode
Input aperture	22 mm
Wavelength	Dual wavelength 515 +/- 5 nm & 1.030 +/- 10 nm (343 +/- 3 nm upon request)
Max input energy density	20 µJ/mm² @ 300 fs – 1.030 nm* 10 µJ/mm² @ 300 fs – 515 nm*
Max input power density	4 W/mm² @ 300 fs – 1.030 nm* 2 W/mm² @ 300 fs – 515 nm*
Max input power	100 W
Input polarization	Linear laser polarization required
Transmission	80 % in precession mode 90 % in by-pass mode
Maximum rotation speed	30.000 rpm (500 Hz)
Output aperture	22 mm
Size	375 x 293 x 160 mm
Power supply	24 V – 2 A (5 A peak)
Interfacing	Ethernet

**: Due to fused silica, at higher energies or powers, self-focusing effects may appear, which could eventually damage the following optical components*

	Advised objectives	
Focal length	**50 mm**	**100 mm**
Min kerf size (M^2= 1.1, 1.030 nm, LS-Scan 20)	35 µm	50 µm
Scanning Field	7 x 7 mm²	25 x 25 mm²
Conicity compensation (attack angle)	4 to 8°	2 to 4°
Appropriate material thicknesses without refocusing	100 to 300 µm	200 to 600 µm
Working distance	60 mm	110 mm

These data can change according to laser beam quality, LS-Scan input aperture, or wavelength



Left: Real image showing a precessing beam into a fluorescent liquid

Right:500 µm thick brass and 700 µm thick sapphire cut with LS-Shape, LS-Precess, LS-Scan, and a 5 W femtosecond laser

LS-Split

LS-Split

Dispatching laser power

High power ultrashort pulse lasers are now commercially available, with powers of more than 100 W and with high energy per pulse. Unfortunately, despite the minimized thermal effects of these ultrashort pulses, most of microprocessing applications will still suffer from heat degradations above 20 W, and even more for small parts, where the heat cannot be spread over large surfaces.

To reach a high rate of production while maintaining the quality offered by ultrashort pulse lasers, parallel processing is seen as the only efficient solution.

While splitting the beam on several spots close to each other is seducing, the flexibility of this technique still remains to be improved to be applied in the industry. The only proven and efficient way to increase productivity is by splitting the beam down to several laser heads, each one processing identical workpieces. Laser scanners being components with MTBFs of more than 30.000 hrs, like the LS-Scan, the MTBF of a complete machine with several juxtaposed LS-Scan is almost not decreased, while its productivity can easily be tripled.

To obtain, 2 beams, one LS-Split is needed. To get a third beam, another LS-Split must be added. LS-Splits can be cascaded indefinitely until reaching the desired number of beams. Then the power balance is easily performed by rotating the polarization with LS-Splits entrance waveplates.

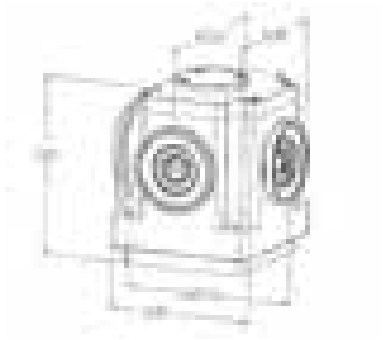
Two LS-Split versions are available: The LS-Split Access allows a manual setting of the power balance. The LS-Split Flex is the same but motorized to be able to easily adapt the power balance during a process, bringing for example the whole power on one single head.

Key features

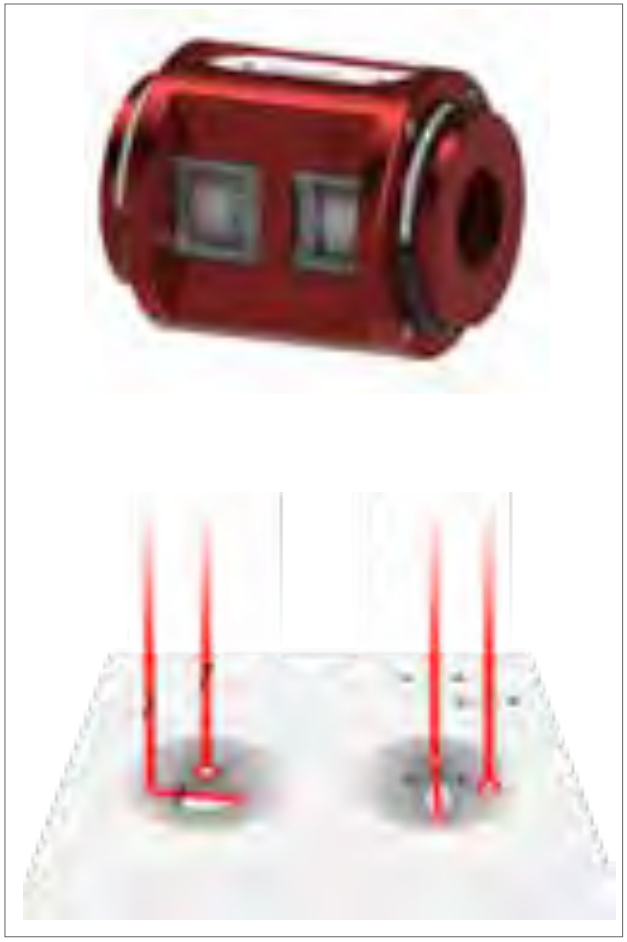
- Dual wavelength 515 + 1.030 nm
- Cascadable compact modules

Specifications	LS-Split Access	LS-Split Flex
Input aperture	22 mm (Advised beam diameter of max 12 mm)	
Wavelength	Dual wavelength 515 +/- 5 nm & 1.030 +/- 10 nm (343 +/- 3 nm upon request)	
Max input energy density	20 µJ/mm² @ 300 fs – 1.030 nm* 10 µJ/mm² @ 300 fs – 515 nm*	
Max input power density	4 W/mm² @ 300 fs – 1.030 nm* 2 W/mm² @ 300 fs – 515 nm*	
Max input power	100 W	
Input polarization	Linear laser polarization required	
Output aperture	22 mm	
Transmission	> 95 %	
Power balance	Manual setting	Motorized setting
Alignment	Reference irises for easy on-site alignment Non-sensitive to beam pointing drifts	
Size	126 x 123 x 130 mm	140 x 123 x 200 mm
Power supply	None	24 V – 1 A
PC interface	None	Ethernet

**: Due to fused silica, at higher energies or powers, self-focusing effects may appear, which could eventually damage the following optical components.*



LS-Polar



Reflections inside a crater depending on polarization and impacting output hole geometry

Trench homogenizer

Laser polarization can often be neglected for surface processes, where the beam always hits the surface with an almost normal angle. However, once the beam hits a tilted surface, or a trench wall forming an angle of more than 45° relative to its normal, polarization becomes relevant for the beam reflection. A polarization perpendicular to the plane of incidence will always be more reflected, therefore less absorbed by the material.

For example, it is almost impossible to obtain a circular percussion drilling in a metal with a linearly polarized laser. If the hole will most certainly be circular on the entrance surface, it will become elliptical on the output side due to internal reflections in the trench or variable absorptions inside the hole. To overcome this phenomenon, it is possible to change the laser polarization into a circular one using the LS-Polar. The circular polarization is like a rotating polarization at the speed of light. In that case, the laser absorption will always be homogenous whatever the incidence angle or the trench direction.

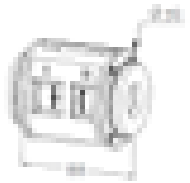
Two LS-Polar versions are available: The LS-Polar Access allows a manual setting of the polarization on target, whatever its location in the beam path. The LS-Polar Flex is the same but motorized to be able to adapt the polarization state during a process, to optimize the absorption for example.

Key features

- Dual wavelength 515 + 1.030 nm
- Compensation of elliptical polarizations caused by intermediate mirrors

Specifications	LS-Polar Access	LS-Polar Flex
Input aperture	22 mm (Advised beam diameter of max 12 mm)	
Wavelength	Dual wavelength 515 +/- 5 nm & 1.030 +/- 10 nm (343 +/- 3 nm upon request)	
Max input energy density	40 µJ/mm² @ 300 fs – 1.030 nm* 20 µJ/mm² @ 300 fs – 515 nm*	
Max input power density	8 W/mm² @ 300 fs – 1.030 nm* 4 W/mm² @ 300 fs – 515 nm*	
Max input power	100 W	
Input polarization	Linear laser polarization required	
Output aperture	22 mm	
Transmission	> 95 %	
Polarization setting	Manual setting	Motorized setting
Alignment	Reference irises for easy on-site alignment Non-sensitive to beam pointing drifts	
Size	76 x 64 x 64 mm	80 x 100 x 200 mm
Power supply	None	24 V – 1 A
PC interface	None	Ethernet

**: Due to fused silica, at higher energies or powers, self-focusing effects may appear, which could eventually damage the following optical components.*



LS-View

LS-View

Vision through the scanner

Dedicated to scan field observation before, during, and after the laser process, the LS-View is a passive vision system aligned with the laser beam. No mechanical stage movement is required to get a clear image of the workpiece.

Before the process, viewing the scan field center can help positioning the workpiece at the right place. During the process, displaying the ablation allows a visual monitoring of the process. After the process, another visual inspection can validate that the ablation has been done where it was supposed to be.

Including a dichroic optic for wavelength splitting, an objective with its focus setting, an interference filter for getting a sharp image, and a ½'' camera, the LS-View offers a direct visualization of the center of the objective field, with resolutions down to 8 µm.

In addition to XY positioning, vertical resolution is in the range of the laser Rayleigh length which allows a fast Z positioning of the workpiece without having to engrave it.

Directly connected to a computer through an ethernet interface, the LS-View's camera can be displayed in the KYLA®'s software, a full microprocessing software able to communicate with several stages, cameras, and lasers.

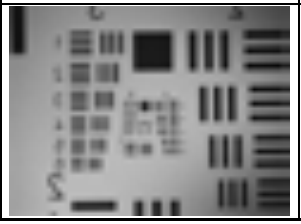
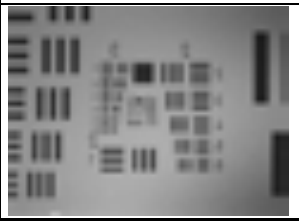
Alternatively, the image can be displayed on another software as any standard camera.

Key features

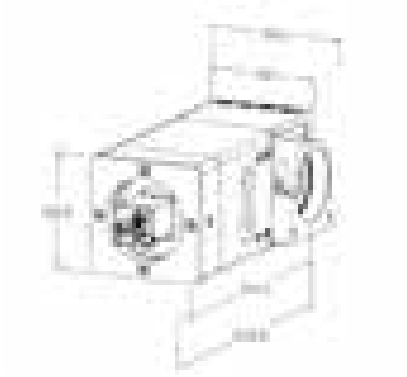
- Dual wavelength 515 + 1.030 nm
- High resolution image
- Less than 2% laser attenuation
- Focus setting

Specifications	LS-View
Input aperture	22 mm (Advised beam diameter of max 12 mm)
Wavelength	Dual wavelength 515 +/- 5 nm & 1.030 +/- 10 nm (343 +/- 3 nm upon request)
Max input energy density (rep rate ≤ 100 kHz)	40 µJ/mm² @ 300 fs – 1.030 nm* 20 µJ/mm² @ 300 fs – 515 nm*
Max input power density	8 W/mm² @ 300 fs – 1.030 nm* 4 W/mm² @ 300 fs – 515 nm*
Max input power	100 W
Input polarization	Any
Observation wavelength	700 nm
Transmission	> 95 %
Output aperture	22 mm
Alignment	Reference irises for easy on-site alignment
Size	230 x 104 x 89 mm
Power supply	Power over Ethernet or 24V – 500 mA
PC interface	GigE RJ45

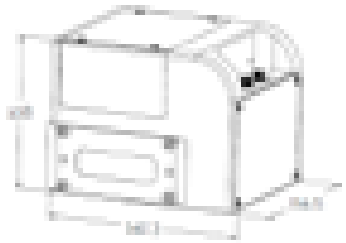
: Due to fused silica, at higher energies or powers, self-focusing effects may appear, which could eventually damage the following optical components.

	F-Theta objectives	
Focal length	**50 mm**	**100 mm**
Field size	4 x 3 mm	8 x 6 mm
Optical resolution	8 µm	14 µm
USAF test		

These data can change according to LS-Scan input aperture, telecentricity, or lighting



LS-Scan



LS-Scan

High acceleration laser head

Dedicated to laser micromachining and high accuracy marking, the LS-Scan is LASEA's unique scan head. While conventional marking applications require high scanning speeds with accuracies around 30µm, micromachining still requires speed to prevent from heat accumulation, but the accuracy is a lot more critical, and the drawings often feature a lot more details with constant needs for accelerations.

The LS-Scan's technology, based on flat moving coil motors, is different from conventional moving magnet technology.

Moving coils being lighter than magnets and the technology having a 5 times less current consumption, the LS-Scan reduces thermal drifts and offer acceleration ramps about 20% smaller than traditional moving magnet scanners.

Thanks to these performances, more laser power can be used without degrading the machining accuracy and hence the cycle time can be reduced.

Each LS-Scan motor is connected to a DIN rail mountable steering board having an Ethernet interface to connect to a computer. The process is driven by our software KYLA™, a full micromachining software able to communicate with several stages, cameras, and lasers.

Alternatively, the standard XY2-100 protocol can be used with an external steering board and software.

Key features

- High acceleration
- Low thermal drifts
- 3D available
- Easy interfacing with KYLA micromachining software
- XY2-100 protocol compatible

Dynamics		LS-Scan XY 10	LS-Scan XY 15	LS-Scan XY 20
Scanner aperture		10 mm (Advised beam diameter of max 6 mm)	15 mm (Advised beam diameter of max 9 mm)	20 mm (Advised beam diameter of max 12 mm)
Step response time[1]	1 % of full field	0,4 ms	0,44 ms	0,6 ms
	10 % of full field	1,8 ms	2,0 ms	3,1 ms
Maximum scanning speed		64 rad/s		

[1] Time to accelerate and decelerate to a new position with a settling amplitude below 0,1 % of full field (+/- 0,05 %)

Precision

Positioning resolution	1 µrad
Repeatability	+/- 1 µrad
Thermal drift (after an 8h job)	+/- 20 µrad
Accuracy	Given by field curvature compensation procedure

Common specifications

Full field	640 x 640 mrad
Cooling	Passive
Interface to steering board	2 coax connectors (Shared Data/Power connection)
Size	142 x 115 x 108 mm

LS-Scan Z

Input aperture		22 mm (Advised beam diameter of max 12 mm)
Beam diameter modification		x 0,8
Step response time[1]	1 % of full field	2,5 ms
	10 % of full field	6 ms
Size		109 x 70 x 80 mm^3

Control cards

32 bit steering board	DIN rail mountable Ethernet interfacing Back plane bus for master-slave network (up to 8 LS-Scan) Up to 2 stepper drivers output (PULSE/DIR) to support dual axis on-the-fly processing (infinite field)
Interface board for XY2-100 standard	Interface to use alternative steering boards (RTC5, USC-3, ScanMaster, SP-ICE, GC-201, ...)

Available objectives

Focal length	50 mm	60 mm	100 mm	160mm	255mm
Min spot size (M^2= 1,1, 1.030 nm, LS-Scan 20)	10 µm	12 µm	16 µm	22 µm	35 µm
Scanning field	10 x 10 mm	15 x 15 mm	60 x 60 mm	100 x 100 mm	180 x 180 mm
Z field (with Z module option)	0,8 mm	1 mm	3 mm	7 mm	20 mm
Working distance	60 mm	66 mm	126 mm	176 mm	317 mm

These data can change according to laser beam quality, LS-Scan input aperture, telecentricity requirements, or wavelength

LS-Lab

LS-Lab

The right set-up for micromachining

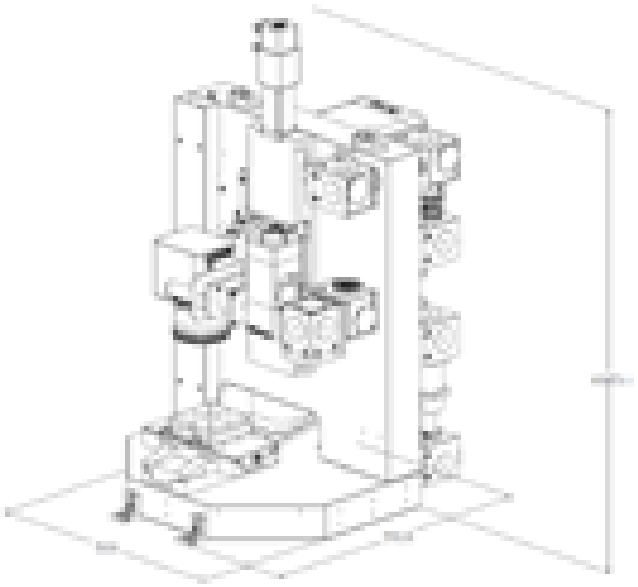
Just like a high-end micromachining system, this small lab set-up, combined with LASEA's beam management modules, allows performing high precision laser processes. Equipped with Nano positioning stages and an electrical cabinet for safety management, the LS-Lab is the link between OEM modules and a ready-to-use laser set-up.

Designed to give access to cutting, drilling (zero taper), texturing, marking, engraving, or thin film removal applications, this set-up is pre-mounted and aligned with the chosen optical configuration and is to be placed on an optical table, next to a laser. Nothing else is required to start micro-machining! Considered as a partly completed machinery, this set-up is a class 4 system, and therefore requires the use of safety eyewear and all the appropriate protections. It can easily be integrated into a class 1 environment as it already includes a safety shutter with several sensors, all checked by a safety controller.

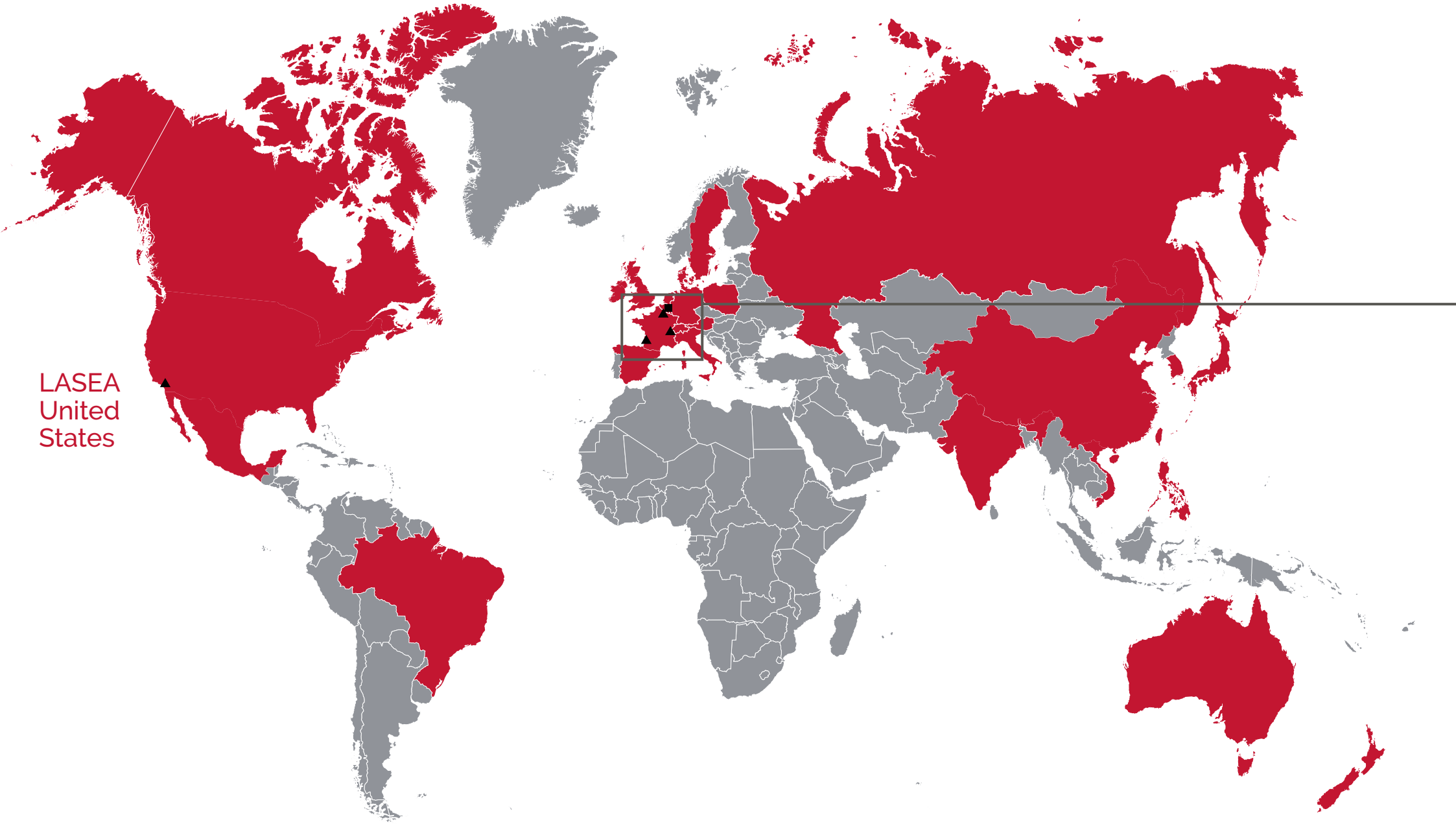
Key features

- 9 high quality beam benders
- 500 nm resolution
- 160 x 160 x 300 mm field
- Safety management
- Easy alignment
- Possibility to add LASEA's beam management modules:
    - LS-Shape
    - LS-Precess
    - LS-View
    - LS-Scan

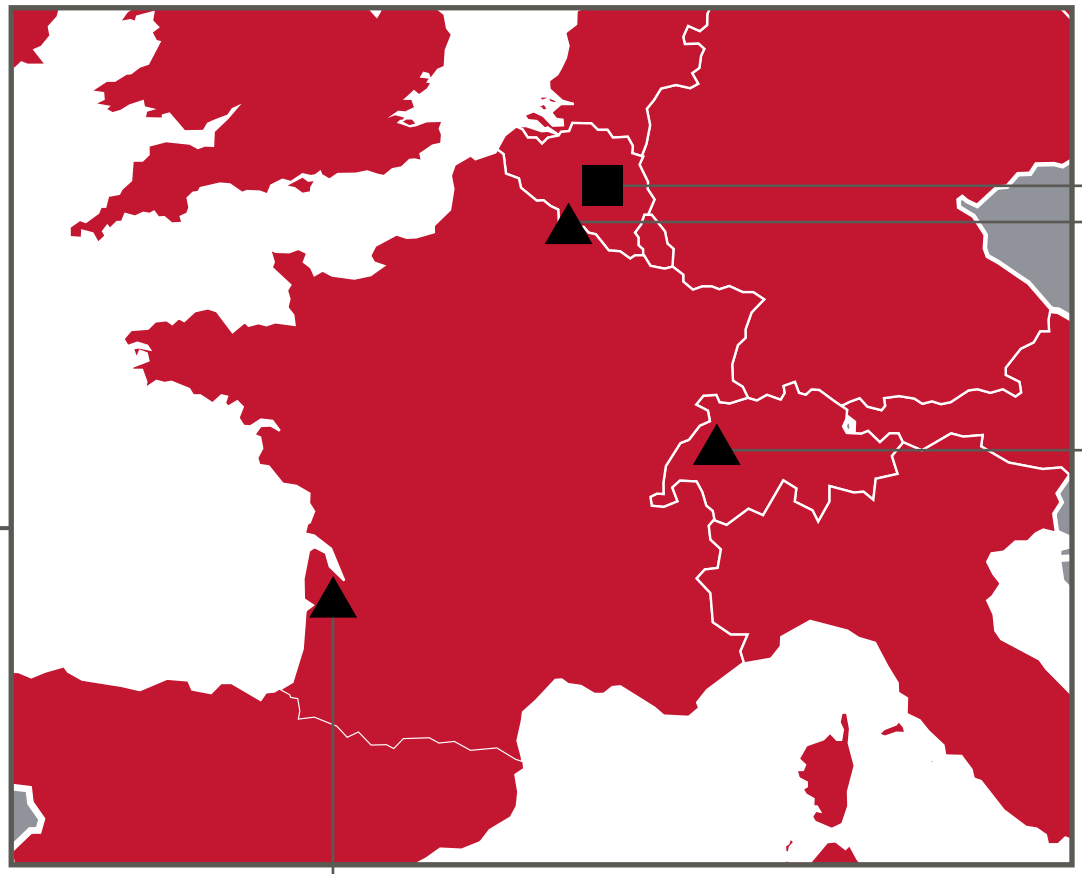
Specifications	LS-Lab
Material	Granite
Beam path	10 high accuracy kinematic and lockable beam benders, dust protection
Input aperture	22 mm (Beam diameter of max 12 mm)
Wavelength	Dual wavelength 515 + 1.030 nm (343 nm upon request)
Z stage	Z Travel of 300 mm Z Resolution of 100 nm Z Repeatability of +/- 1 µm Z accuracy of +/- 2,5 µm over the full travel, +/- 1 µm over 50 mm Straightness of +/- 6 µm over the full travel, +/- 2 µm over 50 mm Pitch/Roll/Yaw of 60 µrad over the full travel, 20 µrad over 50 mm Maximum speed of 100 mm/s
Sample holder	Suction system (vacuum pump not provided) with kinematic tilting base plate
Electrical cabinet	19'' 12U cabinet with several racks for safety, module, and stage management
Control panel	Movable control panel with emergency stop and reset pushbuttons, and various pushbuttons depending on the chosen options
Size	600 x 700 x 1.056 mm
Power supply	100-240VAC – 16 A max
PC interface	Ethernet & Firewire



	Options
Objectives	Various objectives available with focal lengths from 10 mm to 254 mm
Fume extractor	Fume extractor with Hepa filters and nozzle
PC	Workstation with PC, 2 screens, keyboard, and mouse
Available modules	LS-Shape, LS-Precess, LS-Polar, LS-View, LS-Scan
XY stages	XY Travel of 160 x 160 mm XY Resolution of 10 nm XY Repeatability of +/- 100 nm XY accuracy of +/- 500 nm over the full travel, +/- 300 nm over 50 mm Flatness of +/- 2 µm over the full travel, +/- 1 µm over 50 mm Pitch/Roll/Yaw of 70 µrad over the full travel, 50 µrad over 50 mm Maximum speed of 250 mm/s Load capacity of 10 kg



More than 1500 laser systems throughout the world



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The information in this catalogue only contains general descriptions and/or performance features that, in a concrete application, may not always apply in the form described or represented here or may have changed due to further development of the products. The performance features desired shall only be binding if they have been expressly agreed upon in writing at the time of the contract. The machines may include some options, accessories and control unit alternatives.

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LASEA

LASER SOLUTIONS

Our precision makes it possible

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